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struction. Six species of the common marine shells of the neighborhood were collected; also stone implements, and pieces of crumbling bones,—portions of the skeletons of men. This mound* may have been the "artificial eminence near the shore," upon which stood the dwelling of the cacique, Hirrihigua, who bravely opposed the adventurous but cruel Pamphilo de Narvæz in his expedition to Florida, in the year 1528; and the meagre remnants of a human form whose sepulchre we had rudely violated, may have belonged to the outraged and vindictive chief, who, stung by the remembrance of his wrongs, replied to the overtures of De Soto with words of scorn.†

THE SYLVA OF MONTANA.

BY J. G. COOPER, M. D.

The following notes comprise an enumeration of the trees of the Rocky Mountains, etc., from Fort Benton, Nebraska, to Fort Colville and Fort Dalles, Oregon, with remarks on their distribution.

Smooth Sumac (*Rhus glabra?*). No species extends along the Upper Missouri above Fort Union, and I am therefore inclined to think that the species of the Columbia Plain, which extends north to Fort Colville, is distinct though nearly allied to this. In Walla Walla valley it becomes fifteen feet high, and may attain, farther south, to the size of a small tree. It grows also in the Yakima valley, and west to Fort Dalles, Oregon.

Ash-leaved Maple (*Negundo aceroides*). The Box Elder reaches the Rocky Mountains at Fort Benton, but does not cross them there, no species reaching the Columbia river, though the climate is so much milder than that of the Upper Missouri. This is an additional reason for considering the western species (of California, .etc.) distinct from the eastern, though that of Utah and Western Texas may very probably be the latter. The *Rhus* shows a distribution the reverse of this, as compared with the eastern *R. glabra.*

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* Vide Irving's Conquest of Florida. Ed. 1869, pp. 28, 58, 59.

† Hirrihigua said, "I want none of their speeches nor promises; bring me their heads, and I will receive them joyfully." Id., p. 60.

SMOOTH MAPLE (*Acer glabrum*). This commences to appear at the eastern base of the Rocky Mountains, and grows entirely across to Fort Colville and the east slope of the Cascade Range, becoming forty feet high and a foot in diameter. *A. tripartitum* Nutt., is merely a young or dwarfed form of it in dry soil.

CHOKE-CHERRY (*Cerasus Virginiana?*).* A tree, apparently this species, grows all the way across the mountains, extending to the Bitterroot Range, and growing thirty feet high and six inches in diameter. A small cherry tree, or rather a shrub, grows about the borders of the Columbia Plain, apparently the same in leaf, but I think the fruit is larger. I have never seen the flowers.

CHERRY (*Cerasus mollis?*). I found a shrub at the Cœur d'Alene Mission and westward, which I took for this from the leaves. It is stunted in that latitude.

WESTERN MOUNTAIN-ASH (*Pyrus fraxinifolia? vel Americana?*). The Mountain-ash of the western mountains, scarcely distinct from that of the north-east, first appeared on the east slope of the Cœur d'Aleñe Range, and extends in small numbers to Fort Colville, scarcely deserving to be called a tree anywhere. I did not find it with fruit on this route.

RIVER HAWTHORN (*Cratœgus rivularis*). A hawthorn with black berries, and otherwise the same every way., extends from the east base of the Rocky Mountains, west to the Cascade Range ("Willamette River," Nutt.), forming a shrubby tree fifteen to twenty feet high. It is finest along the Spokan River.

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* See Torrey and Gray's Flora of Nebraska.

Red Hawthorn (*C. sanguinea?*). The red-berried Haw grows sparingly from Walla Walla to Fort Colville, but is so similar in leaf to the preceding that it may perhaps be only a variety. Specimens of both collected in fruit give an opportunity of trying the distinctions of the seedling plants.

Oregon Bearwood (*Frangula Purshiana*). This species of Buckthorn occurs on both slopes of the Cœur d'Aleñe Mountains, but not farther east. With it occurs a low bushy species of *Rhamesus*, as shown by fruiting specimens of each collected together.

Oregon Service-berry (*Amelanchier alnifolia*). I must consider this distinct from *A. Canadensis* of the east, because it preserves its peculiarities of leaf, growth and fruit, from the eastern base of the Rocky Mountains to the Pacific coast, through much variety of climate and soil, differing only in height in the drier localities. It attains its greatest luxuriance and excellence of fruit in the valley of the Hell Gate river, where our whole command feasted on the berries for several days.

Green Dogwood (*Cornus pubescens*). It was first seen near the crossing of Bitterroot river, and extends at intervals to the west coast.

Western Sugar-berry (*Celtis reticulata*). This tree is strictly limited toward the north-west by Snake and Columbia river, as observed in 1853. It is scarce along them and grows only about thirty feet high, with a short trunk sometimes a foot thick.

Oregon Oak (*Quercus Garryana*). This oak does not grow east of the eastern base of the Cascade Range, or north of the Yakima river, on this side. No oak occurs from the Columbus river to Fort Union, on the Missouri, near which place is found *Q. macrocarpa*. No ash grows in a similar interval, though one extends to Milk river on the Missouri.

Oregon Ash (*Fraxinus Oregona*). This first appears at the Dalles.

Western Pogue-birch (*Betula occidentalis*). This birch forms a shrubby tree, from Sun river through the Rocky Mountains to the Cœur d'Alene river, where it becomes of large size, sometimes two feet in diameter and sixty feet in height, of handsome appearance, and with a laminated bark of which the Indians make canoes. The color of the bark is of a pale coppery yellow, dark on the branches, and the leaf is always quite small. It is common at Fort Colville, where I took it for *B. papyrifera*, when leafless, in 1853, and the dwarfed form, growing along streams of the Great Plain to the Cascade Mountains, is the *B. resinosa* of my report. I saw it at Fort Walla Walla, but not at Fort Dalles.

Green Alder (*Alnus viridis?* or new species (perhaps *rubra* of Bengard Veg. Sitch.). This alder has a range similar to that of the western birch, and attains a similar size toward the west. Its bark is less white and its leaves finer toothed than those of *A. Oregona* near the coast, which I first saw at Fort Dalles.

Willows (*Salix*). The willows were only to be had in leaf, and if determinable, will probably prove to be *S. Fendleriana*, *Hookeriana*, and *longifolia*, but I cannot give accounts of their respective distribution, as these trees need long acquaintance to distinguish them by the leaves only.

Narrow-leaved Poplar (*Populus angustifolia*). This peculiarly western poplar does not extend east of the base of the Rocky Mountains at Forts Benton and Laramie. It varies much in the leaf, even on the same tree, some being four inches wide; and though I believe it to be the most common species in the mountains, I was often in doubt whether this or *P. balsamifera* was the most so, as I could not always distinguish between them at a little distance.

Balsam Poplar (*P. balsamifera*). This seems to be the prevailing species of "Cotton Wood" along the Missouri above Fort Union, and across the Rocky Mountains, and is not uncommon to the west coast. The tree seems distinguishable when leafless by its yellow twigs. I doubt whether *P. monilifera* grows so far north in the mountains.

ASPEN (*P. tremuloides*). The aspen occurs at intervals throughout the mountains, usually about gravelly ponds, but is not common.

TWISTED PINE (*Pinus contorta*). I first met with this pine at the east base of Mullan's Pass, where a single tree of unusual size seemed to me at first distinct from this species. It was two feet in diameter, and fully sixty in height, the branches crowded with cones of all ages, but west of the pass I found the more usual form abundant, which indicated this to be only a luxuriant specimen. It is the most prevalent tree of the higher Rocky Mountains, as far down the west slope as Deer Lodge prairie. It then becomes rare in the valley until reaching the crossing of the Bitterroot, when it again becomes abundant, forming groves by itself on poor sandy or gravelly soil exactly as on the coast. Towards the rainy summit of the Cœur d'Aleñe Mountains, however, it is scarcer, being the seventh in abundance of the trees; it is still rarer on the west slope, but at the Mission rather common, though not observed much farther west. Its growth seems like that of most other trees more dependent on a certain degree of moisture than on temperature.

PITCH PINE (*P. rigida*). This eastern species is common on the eastern spurs of the Rocky Mountains, in the upper "Bad Lands" of the Missouri, from Milk to Judith river, and on the "Black Hills" near Fort Laramie, but I did not find it west of the Rocky Mountains or of Fort Benton.

YELLOW PINE (*Pinus ponderosa*). The Yellow Pine is the prevailing species in most parts of the Rocky Mountains traversed, though much less common than others in the Cœur d'Aleñe Range. It presents the same appearance from the east base of the Rocky to that of the Cascade Mountains, being unmistakable as far as it can be seen. On the Hell Gate I saw the largest, some fully four feet in diameter, and it grows in the driest sandy soil, where no other tree can exist. *P. Banksiana* and *P. resinosa* have been reported to grow along the Spokan river, but I am sure none occurred at parts I have visited, and think this and the preceding have been mistaken for them.

WESTERN WHITE PINE (*Pinus monticola*). I found scattered trees of this beautiful species on the highest parts of the Rocky Mountains, but from the east base of the Cœur d'Aleñe Range to its summit it rapidly became one of the most abundant and luxuriant trees, again disappearing gradually, but faster, as we descended their west slope. It attains a diameter of four feet, and a height, probably, near one hundred and fifty, resembling the eastern White Pine (*P. strobus*) in habit, but with finer grooved bark (like that of *Carya tomentosa*, Mockernut), more slender and shorter leaves, and much larger cones. The wood is very fine-grained and soft. The specimens, from stunted trees in the Bad Lands at Little Rocky Mountain creek of the Missouri, are so different as to seem distinct in species, or at least a very marked variety, probably the latter.

BLACK SPRUCE (*Abies Menziesii*). This Black Spruce is as abundant on the higher parts of the Cœur d'Aleñe as on the coast, and presents exactly the appearance described in my former report. It is perhaps less in size, but has the same drooping, dense twigs and foliage that give so sombre an appearance to the coast forests. I saw it nowhere else on the route.

OREGON YELLOW FIR (*A. grandis* and *amabilis*). From many specimens of cones and leaves, together with observations on the trees, I am strongly inclined to consider these the same species, not varying more than several others. The lower white and smooth-barked form, with dense growth and foliage, appeared moderately common on the east slope of the Cœur d'Aleñe Mountains, and across the summit. On the west slope it gradually became taller, more open in branches and foliage, the cone larger and with broader scales, the bark grooved more and more, and darker in shade until in the rich moist bottom-land the tree is one hundred and fifty feet high and over four feet in diameter. This is the true *A. grandis*, and the same as grows along the Lower Columbia, while a middle form occurs sparingly about Puget's Sound, and was referred to by me in a former report as possibly being the true *A. taxifolia*, for which see the notes on *Abies Douglassii*. The dense growing, white-barked variety (*amabilis*), attains three feet in diameter, and one hundred feet in height, on the east slope of the above-named mountains.

DOUGLASS, OR RED FIR (*Abies Douglassii*). This spruce exhibits nearly as much adaptability to all circumstances as *Pinus ponderosa*, which it accompanies throughout the Rocky Mountains, but is much less abundant in the drier situations than that, and more so on the moist Cœur d'Aleñe Range. It varies in the color of the bark, length of cones, leaves, etc., as might be expected in so many localities.* The young shaded tree, growing in the moistest spots, has leaves an inch and a half long, shining, and the bark smooth and white, so that only the single arrangement and more lax growth distinguish it from young trees of *A. grandis*. This is doubtless the true *A. taxifolia*, as before suspected, and loses its distinctness of character with age. This form, with very long slender leaves and cones, prevails mostly on the west slope of the Cœur d'Aleñe, Cascade and Coast ranges, where there is most rain. The largest Rocky Mountain trees do not quite equal some of those on the Lower Columbia. It is the only spruce I saw from Fort Colville to the Spokan river, where its range is stopped by the Great Columbia Plain. It reappears at the Dalles, and probably also on the Blue Mountains.

After observing these coniferæ, and other trees also, for some time, the eye learns their general habit so well, that there is usually no difficulty in distinguishing species at sight, and at a considerable distance off.

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* It grows on the first mountain range, nearly as far east as Milk river, to longitude 107°.

Williamson's Spruce (*Abies Williamsoni*). This fine spruce is abundant on the summits *only* of the Cœur d'Aleñe Mountains, where it grows three feet in diameter, and one hundred feet in height, with a ragged gray bark much like that of the eastern Sassafras. The general habit is like that of the Hemlock Spruce, but rather stiffer, and the foliage is denser, forming several imperfect rows on the twigs. The cones are two and a half inches long, pendant from the highest branches only. None of them contained ripe seed at the time of my visit. The wood appears much like that of the Hemlock Spruce. The closeness of its limitation to the dividing ridge is remarkable, since, although found at the base of this ridge, it there grows only from three to six feet high, and produces no cones. I took these at first for some species of Juniper. Newberry's figure represents it as being too rigid, like *A. Douglassii*. It is far more feathery.

Merten's Spruce (*A. Mertensiana**). I have long considered this distinct from *A. Canadensis*, though the difference, if any, is only in its larger growth, and perhaps in the glands of the seed, which I have not compared with those of the eastern tree. There is however a wide interval in their range, *A. Canadensis* not growing north or west of Lake Superior. I first met with this on the west slope of the Cœur d'Aleñe Mountains, only a few dwarf fruitless specimens growing on the east side, and none on the summit. It ceases west and north of the Lake on the route I followed.

Western Larch (*Larix occidentalis*). I found this fine Larch first near Bitterroot valley, whence it becomes rather common throughout the route to Fort Colville, holding a middle place in relation to the moisture and temperature of the various portions. It is about equal to *Pinus ponderosa* in size, but has very short branches, as they break off from the brittleness of the wood as it grows high. The bark is reddish like that of the pine, but only an inch or two thick instead of four or five, and of course less deeply furrowed. The pale, elegant foliage, is easily distinguishable where it forms groves on the mountain slopes, but it is more scattered in its distribution than most coniferæ, never, as with the eastern *L. Americana*, growing in swamps.

**A. Bridgei* Kellogg. Proc. Cal. Acad., 1858–'59.

WESTERN ARBOR-VITÆ (*Thuya gigantea*). Scarce along the lower part of the Bitterroot, this enormous tree becomes fully developed only on the west slope of the Cœur d'Aleñe Range, where a cedar swamp occurs, the trees, perhaps, even larger than near the coast. They range from six to eight feet thick, and a dozen of these giants often grow in a space of five or six rods square, so that Lieut. Mullan's party could not find room to pass between them, and had to cut down some, the road going over the stumps! Nothing compares with this in tree growth except perhaps the *Taxodium* swamps of the Gulf States, and here the cedars seem to have grown from sand and water only!

RED CEDAR (*Juniperus Virginiana*). This grows large and abundant along the Upper Missouri, and more scattered, though still a tree, entirely across the Rocky Mountains, following the rivers around the Cœur d'Alene Range to Fort Colville, and south to the Spokan river at least. I was told that a large grove of it (or possibly *occidentalis*) grew on the north-west border of the Great Plain of the Columbia, but could not determine which those are which grew near Fort Dalles. I was very much puzzled to determine whether this or *J. communis* was the species sometimes seen on the Upper Missouri, of a tree form, but with large berries. It may be a hybrid, or perhaps *J. occidentalis*, with which it agrees in the colorless wood. *J. communis*, in its low prostrate forms, is very common along the Upper Missouri, but I did not see it farther west, and the dwarf form of the Cascade Mountains, found in 1853, *may* belong to *J. occidentalis*, though Dr. Newberry found farther south on these mountains what he considers *J. communis*.

Oregon Yew (*Taxus brevifolia*). The Yew, first met with on the east slope of the Cœur d'Alene Mountains was there low and prostrate like *T. Canadensis*, but became larger on the west side, attaining two feet in diameter and sixty feet in height, exactly resembling that of the coast. It does not pass Lake Cœur d'Aleñe. The elevation of the east slope of these mountains is much greater than of the west, which accounts for the dwarfing of this, as well as of *Abies Mertensiana* and *A. grandis*.

DISTRIBUTION OF THE FORESTS, ETC., WITH FACTS RELATING TO PHYSICAL GEOGRAPHY.

The configuration of the country traversed, as well as its productions, climate, etc., naturally divide it into four sections, which have limits closely connected with those of the geological formations. A closer exploration would perhaps also separate these into a larger number, but I propose now to speak of them chiefly in connection with the distribution of the forests, which everywhere indicates to a great extent that of the smaller plants and animals also.

Hesperian Region.[*]—From the Rocky Mountain summit, east to Milk river, the country, although the prairie vastly predominates, is crossed by the easterly ranges of the Great Cordillera, upon which are found several trees peculiarly western, with some eastern species commingled. Though low where the Missouri breaks through, the mountains rise to a great height in the distance, and are said to be well wooded on many portions. Of this we had evidence in the large quantity of coniferous timber covering the rocky hills and bluffs, from above Milk river nearly to the Judith.[†] Its growth was limited only by the prevalence of fires wherever the grass grows well, and therefore trees became very scarce when we entered the "Cretaceous formation No. 1," which is of a porous character, not retaining moisture in its strata like many parts of the Tertiary farther down, though covered with a very close growth of grass. As usual throughout the route it is the slopes facing the north that have most of the woods on them. The species met with were the eastern *Pinus rigida* and *Juniperus Virginiana*, the boreal *J. communis*, the western *Pinus monticola* and *Abies Douglassii.* If any other occurs it is, probably, *Pinus ponderosa*, which grows in the Black Hills toward the south-east, according to Dr. Hayden.

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[*] In my article in the Smithsonian Report, 1858, I called this the *Paducan*, but as that name is preoccupied in Kentucky, I now propose that here given, and think *Hesperia* would be far more elegant and appropriate than the sentimental "Wyoming" for the new territory which includes most of the region referred to.

[†] A sharp double bend in the river, below the Mussel Shell, near longitude 108°, is the point where it has cut through the mountains by a canon, with nearly vertical walls 600 feet high!

Along the rivers a different group, the deciduous trees found in that situation throughout the plains of the Missouri basin, reached a little above Milk river, nearly all, however, ceasing at the point where the mountain woods begin.* Above here only *Populus balsamifera* occurs in scattered spots with stunted shrubs of *Negundo aceroides* and *Prunus Virginiana*, so that for several days below Fort Benton, one hundred and seventy-five miles by the river, the boats could scarcely obtain enough wood for fuel, and there is almost none to be seen. *Populus angustifolia* also begins at Maria's river, and is the prevailing species along the upper branches of the Missouri. The same destitution of wood continues from Fort Benton to the "Gate of the Mountains" along the Missouri, though its branches are better supplied with the same trees. Thus the influence of the soil belonging to "Cretaceous No. 1" is the same throughout its limits, but I believe is due to the causes above mentioned rather than to its Cretaceous nature, since on the lower Missouri it is much more productive of timber than "No. 4" of Dr. Hayden's section, or his "lignite tertiary basin," probably because it there receives more rain.

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*Those seen below *only* (above Fort Union) were *Fraxinus Americana* (or *sambucifolia*? or both) and *Ulmus Americana*, the former pretty common, the latter rare. *Quercus macrocarpa* does not pass the Yellowstone.

Though we merely skirted the northern limits of the Hesperian region it shows, even there, sufficient distinctness of products to separate it from the "Dacotan" east of Milk river. Even its woodless plains differ materially in vegetation, having a better growth of grass, and in some very sandy tracts, presenting the shrubby forests characterizing the whole "Rocky Mountain Province." It evidently runs into the "Saskatchewan" region to the north, which is truly a "Campestrian" one. Farther explorations will doubtless reveal more spurs of the Rocky Mountains near the one hundred and seventh meridian, with the western trees covering them, and the fall of the Missouri, with its lofty cliffs throughout this region, plainly shows that even the plains form an elevated plateau, or basin, from which the descent to the "Dacotah" plains is by a sort of step,. often sudden, or marked by the protrusion of lower rocks above or near to the surface. I have generally found that the *base* of a mountain range formed a stronger limit to the range of species of trees than the summit, and this fact is illustrated in the present case by the change occurring above Milk river at the first mountain range. The rule extends also to other plants and to animals, as all explorers will testify.

At the eastern base of the Rocky Mountains proper, where the Missouri literally cuts through them, the fact is repeated, and there I found the following western trees, which will probably be found also to reach the more eastern ranges: *Acer glabrum* (*tripartitum* is a variety), *Betula occidentalis*, *Alnus viridis* or *rubra?* (*viridis* is a boreal species) and *Populus angustifolia*. *Amelanchier alnifolia*, although a tree on the west side, is but a shrub on the east slope of the mountains, from the influence of a drier climate. It is said to extend to Lake Superior. *Populus tremuloides* is also a boreal species, occurring in the mountains everywhere above a certain elevation. Some other boreal species have been found by Dr. Hayden to straggle to the Black Hills, such as *Pinus Banksiana*, *Abies nigra* (and *alba?*). Though

I did not find them I have no doubt of their identity, having seen the specimens. It is somewhat singular that all the fresh-water mollusca I found in the Missouri, above Fort Benton, were distinct species from those obtained by Dr. Hayden in the streams east of the mountains (except *Unio luteolus* and *Physa heterostropha*), thus showing that the limits of the region apply to animals as well as plants. The rest were *Limnæa palustris, bulimoides* and *desidiosa, Sphærium striatinum* and *Margaritana falcata* Gld. Dr. Hayden found thirty other species in Nebraska.

Kootenay region.—My observations last summer confirm the propriety of this division of the north-western province (*Caurine*), being defined towards the south essentially as I marked its limits in the Smithsonian Report of 1858. It consists, south of latitude 49°, chiefly of the elevated basin of Clark's Fork, with the mountains which surround or traverse it, nearly all being more than 2000 feet above the sea (about 4000 feet where we crossed the Bitterroot), and from that extends up to perpetual snow at probably a level of 10000 feet.

Though, as shown by the accompanying notes, the western rim of this basin presents many marked differences from the portion east of the Bitterroot crossing, analogous to those between the Coast and Cascade Ranges farther west, I cannot now consider them distinct regions, but as united by the common character of being almost completely wooded. This character must also annex to it the lower country along the Spokan and the Columbia above that tributary, most of which is, however, so mountainous as to reach as high as the basin of Clark's Fork. The woodless portions of this region were small in extent along our route, being limited to the porous, dry tertiary and alluvial basins of Deer Lodge and St. Mary's valley, with small tracts in the valleys connecting and branching from them. The most extensive prairies are south of our route, towards the heads of these valleys, with a connected valley toward the north on Flathead river. So generally are these prairies limited to the porous strata of the later formations that I believe some tracts of high prairie on the western slope of the Rocky Mountains indicate the presence either of tertiary or deep beds of drift, which latter cover the prairie summit of Mullan's Pass. It must be remembered, however, that this relation to different strata is the only one depending on their porosity, and that where rains are more abundant this ceases to prevent the growth of trees. Strata resembling the Cretaceous of Nebraska in density are on the west side thickly wooded, so that there is no indication of their nature from the absence of trees. The impervious rocks and thin soil of the Cœur d'Aleñe Range evidently assist the more rainy climate in producing a moisture fitted for the peculiar group of trees characterizing it, and there is a more marked difference in its opposite slopes than in those of the Rocky Mountains, more striking, however, on account of the greater number of species of trees found there. The contrast is most important between the west slope of the western rim and the east slope of the eastern.

Many facts show that the trees are more dependent on a certain supply of water than on temperature, as will be seen by comparing the profile of the route with the distribution of the species. Thus on the Rocky Mountains *Pinus contorta* grows only between 5000 and 6000 (or more) feet of elevation, an altitude just sufficient to catch the moisture passing over the general summits of the Cœur d'Aleñe Mountains, in which the pass we went through is 5100 feet high. It reappears at the east base of the latter range, because of the impervious rock there, and the increased moisture deposited on that rim. The various relations of other trees to the influence of moisture are shown briefly by the following facts of their distribution and growth:

Cerasus Virginiana?, *Amelanchier alnifolia*, *Populus angustifolia* and *Pinus ponderosa* are distributed entirely across, but are most highly developed along the Blackfoot and Hell Gate valleys, forming the lower half of the east side of the basin, where there is, probably, a moderately dry and warm summer.

Acer glabrum (and var. *tripartitum*), *Betula occidentalis*, *Alnus rubra?* *Abies Douglassii* and *Cratægus rivularis* grow throughout but thrive most at the west base of the Cœur d'Aleñe Mountains, where there is much more rain and hotter summers (being 2000 feet lower in elevation).

Populus balsamifera and *Pinus contorta* are almost equally wide-spread; they are probably finest on the east slope of the Cœur d'Aleñe Range, where there is a comparatively rainy and cold climate which also favors the variety of *Abies grandis*, called *amabilis*.

Populus tremuloides and *Juniperus Virginiana* are so scantily distributed that no part of the mountains seems to suit them well, though found at intervals in gravelly soil where there is not much shade.

Larix occidentalis is mostly limited to the western rim, and is finest on its western slope.

Cornus pubescens and *Thuja gigantea* merely struggle up the Bitterroot river to the crossing, but are finely developed at the west base of the western rim with *Acer glabrum*, etc.

Pinus monticola is very scarce on the eastern rim and slope; it is a magnificent and abundant tree on the western, and finest near its summit.

Frangula Purshiana, *Pyrus fraxinifolia?* and *Abies grandis* are found over the whole western rim, but are chiefly developed on its western slope and base.

Abies Menziesii is limited to its higher parts above 4000 feet elevation. *A. Williamsonii* to those above 4500 feet.

Abies Mertensiana and *Taxus brevifolia* just straggle to its eastern slope, but are large and numerous on the western between 2000 and 4500 feet elevation.

Finally, *Cratægus sanguinea* and *Cerasus mollis* are confined to the lowest and warmest portions.

Thus while nearly all are found on the western rim, and most of them grow largest on its western slope, only half of them reached the eastern rim along our route, and several of these were merely stragglers. This accords with the general rule that the most trees, both in number and species, grow where the most heat and moisture are combined. The forests of the western rim are far denser than those of the eastern, though the soil cannot be considered generally so good on account of the kinds of rocks from which it is disintegrated.

An exactly parallel case is presented by the Cascade and Coast Ranges, as described in the Natural History of Washington Territory (Pacific R. R. Reports), but there the species, though mostly the same, are somewhat differently arranged to correspond with differences in climate, consequent on the much lower elevation of those ranges and their nearness to the ocean. Yet we there find *Pinus contorta*, *Thuja gigantea*, *Abies Menziesii*, *A. Mertensiana* and *Taxus brevifolia* among the prevailing species at the level of the ocean, while here they do not occur lower than 2000 feet above it, showing that they require moisture rather than coolness of climate, for at the coast the rains are heavier while the mean temperature is far more mild than here. But *Pinus ponderosa*, *Acer glabrum*, *Betula occidentalis*, *Cratægus rivularis*, *Larix occidentalis*, *Pinus monticola*, *Pyrus fraxinifolia* and *Abies Williamsonii*, here characteristic trees, scarcely, if at all, cross the Cascade Range, while *Abies Douglassii*, and several peculiar species not found here, replace them between that and the Coast Range.

It is therefore much safer to assume a similarity in the moisture of the climate and soil of two regions thus widely separated, from comparison of their forests, than similarity in temperature. I am here comparing portions of two regions included between the same degrees of latitude, but according to another rule dependent on the climate of the western regions, all the above species of Rocky Mountain trees are found, or probably will be found to reach the coast either north or south of these parallels, wherever they find the proper amount of rain and heat as combined in these mountains.

Shoshonee region.—The Great Columbia Plains show their peculiar features in prairies extending through the valleys on the route north to Fort Colville, which are, however, so small in extent compared with the forests, as not to be separable from the Kootenay region. Just north of the Spokan are the first extensive plains on the uplands, and to the south these become rapidly spread to the entire exclusion of forest, so that for days together not a tree is seen except shrubby willows on the banks of streams. Even the Blue Mountains show but a narrow strip of timber just along their summits in latitude 46°, which is said to disappear farther south, though the upper waters of the rivers flowing from them are pretty well wooded with deciduous trees. The only new ones that occur, and these only as stragglers from the south, are *Rhus glabra?*, *Celtis reticulata* and, perhaps, *Cratægus sanguinea?*, if more than a variety of *C. rivularis.* On the Walla Walla river are also found *Populus angustifolia*, *P. monilifera*, *Alnus rubra?* and *Betula occidentalis.* Some of the willows are, probably, also distinct from those of the mountains, but being undeterminable from leaves alone, I have omitted them throughout these remarks. (See notes on the trees observed, p. 405.)

A brief comparison of this with the plains of regions east of the Rocky Mountains, will show how little connection exists between soils or rocks and the growth of trees, how much depends on a proper amount of moisture.

The entire plain is underlaid by basalt, covered thinly with a fine dusty soil, which I believe to have been also volcanic in origin, having been poured out with lava in the form of mud. In parts this has been blown into high ridges, while in others it is washed entirely away, leaving the bare rock at the surface. This makes no difference however in regard to the trees, and little to other vegetation. This soil, on some ridges north of the Spokan where there is not much rain, is the richest I saw on the whole route, and produces fine crops near Antoine Plant's prairie. To the south it is covered with grass, etc., and where naturally irrigated by streams, other plants grow luxuriantly. There is then nothing unfavorable to trees in the soil, and indeed, west of the Cascade Range, almost the whole country is basaltic and covered with dense forests. We must look therefore to dryness as the cause of their absence, and so far the observations of the Medical Department, U. S. A., at Fort Walla Walla, Dalles, and Sincoe, show a remarkably small amount of moisture. For particulars, however, I must refer to the "Report on Statistics," etc., of Surgeon General Lawson, for 1860, prepared by Dr. Richard H. Coolidge, U. S. Army.

THE GOLDEN-WINGED WOODPECKER.

BY AUGUSTUS FOWLER.

THIS is an exceedingly valuable bird, especially if it resides near lands of a light or sandy soil. Its food is almost wholly composed of insects, of which ants form the principal living of the young fledged birds. These insect pests form themselves into colonies, and excavate, a little below the surface of the soil, one or more chambers, with galleries leading to them, bringing the soil from around the roots of the grass, leaving them to a free circulation of air, that soon causes them to wither. The Woodpecker sits by the mounds of dirt thrown out by the insects, and as one appears creeping from his den the bird draws him into his mouth with his tongue, and swallowing him, continues to do so until he has destroyed the whole republic. I have examined the birds at such times and have found their stomachs distended to their fullest extent; indeed it seemed as if they could not